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Tulsa Tornado Tribune

"Where People Who Know The Weather
Get Their Weather"



National Weather Service Tulsa, Oklahoma

Fall/Winter, 2003-04

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An Extraordinary Weather Event

What developed into an extraordinary late August weather event across the southern Plains was born over a period of days from typical late summer conditions. A persistent upper ridge of high pressure was parked over the center of the country, resulting in several days of the usual hot and muggy late August weather.

However, as early as August 23rd, National Weather Service forecasters predicted a change in the weather pattern over eastern Oklahoma and western Arkansas. By Thursday the 28th, the change was apparent; the ridge had weakened and an upper level trough of low pressure had developed across the center of the country. This induced

a large surface low just west of Lake Superior. A cold front trailed from this low southwestward across the plains and was poised to move southward into the Tulsa forecast area.

By Friday the 29th, the front moved south into Oklahoma, but became stationary. Meanwhile, a weak upper level distur-

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Editor's Notes

As is usually the case, summer and fall were a bit less active than spring, but saw their share of severe weather. Our thanks go out to the area Emergency Managers, spotters and amateur radio operators for their continued assistance.

Although this newsletter will continue to be sent out primarily via e-mail and the internet, we would be more than happy to send paper copies if requested. If you or anyone you know would like to have a copy mailed to them, please let us know.

Craig A. Sullivan - Editor

The Wind Event of August 1

During the early afternoon of Friday, August 1, 2003, forecasters at the NWS office in Tulsa were keeping a close eye on the atmosphere as a cold front was nearing the Oklahoma – Kansas border. Although the front itself was not especially strong, daytime heating across eastern Oklahoma and western Arkansas created a very unstable airmass with a fairly weak cap. By 3 pm, thunderstorms developed along the cold front in Kansas. With a low level jet expected to develop and wind shear forecast to increase across the region during the evening, NWS Tulsa forecasters expected a merging of cells into



Radar velocity image from August 1, 2003 at 7:09 PM CDT. Red and purple shaded areas represent winds moving away from the radar, while green shaded areas represent winds moving toward the radar. The image shows a well defined wind shift (arrows) across Mayes and Cherokee Counties, with radar measured speeds of 50-64 knots (58-74 mph). Wind gusts estimated near 70 mph occurred in both Hulbert and Locust Grove a short time later.

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Prepare Yourself for Winter Weather

Although the southern plains, including Oklahoma and Arkansas, are more known for the severe storms that strike in the spring, the area occasionally experiences significant winter storms. Heavy snow, freezing rain, sleet and cold temperatures can result in widespread loss of utilities and make travel nearly impossible. The effects of a winter storm may be felt in a community for days or even weeks after the storm is over.

Unfortunately, winter storms can also be deadly. Winter storms are considered deceptive killers because most deaths are indirectly related to the storm. Fatal accidents on icy roads, heart attacks while shoveling snow, and hypothermia from prolonged exposure to the cold are common causes of winter storm related deaths.

NWS Winter Weather Products

A **WINTER STORM WARNING** means dangerous winter weather conditions are **imminent**.

A **WINTER STORM WATCH** means dangerous winter weather conditions are **possible** in your area within the next 24 to 48 hours.

A **WINTER WEATHER ADVISORY** means winter weather conditions are expected to pose an inconvenience, but could become hazardous if caution is not exercised.

The **HAZARDOUS WEATHER OUTLOOK** will be used to highlight expected winter weather hazards in both the short and long term.

Before the Storm

It is important not to be caught off guard. Before winter arrives, you can take some precautions to ensure that when winter weather strikes, you will be adequately prepared. Have the following supplies available:

- First aid kit and essential medications
- Battery-powered NOAA Weather radio, flashlight, and extra batteries
- Canned food and can opener
- Bottled water
- Extra warm clothing, including boots, mittens, and a hat
- Extra blankets
- Emergency heating source
- Fire extinguisher and working smoke detector

You should also assemble a Disaster Supplies Kit for your car, and have your car fully winterized before the winter storm season.

When a winter storm is forecast, listen to NOAA Weather Radio and your local radio and TV stations for updated storm information.

When a **WINTER STORM WATCH** is issued, listen to NOAA Weather Radio, local radio and TV stations for further updates. Be alert to changing weather conditions, and avoid unnecessary travel. Check to make sure you have the appropriate supplies on hand. For those living on farms, move animals to sheltered areas, haul in extra feed, and have a water supply available.

During the Storm

When a **WINTER STORM WARNING** is issued, stay indoors during the storm. If you must go outside, wear several layers of lightweight clothing. Gloves (or mittens) and a hat will significantly reduce the loss of body heat. Cover your mouth to protect your lungs. Walk carefully on snow-covered or icy sidewalks. When shoveling snow after the storm be extremely careful. It is physically strenuous work, so take frequent breaks. Avoid overexertion!

You should avoid traveling by car in a storm, but if you must, keep your car's gas tank full for emergency use and to keep the fuel line from freezing. Let someone know your destination, your route, and when you expect to arrive. If your car gets stuck along the way, help can be sent along your predetermined route.

If you get stuck, stay with your car and do not try to walk to safety. Tie a brightly colored cloth to the antenna for potential rescuers to see. Start the car and use the heater for about 10 minutes every hour, but be sure to keep the exhaust pipe clear so fumes won't back up in the car. Leave the overhead light on when the engine is running so that you can be seen. As you sit, move your arms and legs to keep blood circulating and to stay warm. Keep one window away from the blowing wind slightly open to let in air. *

Spotter Training

Sign-ups for SKYWARN Spotter Training are being accepted. County Emergency Management Directors can start polling their local EM directors and agencies across their counties to find good dates for their spotter training this Winter and early Spring (January 7 - March 31). We generally can only offer one class per county, so talk it up to everyone and let's get a large turnout. You can check available dates on our internet spotter training calendar at:

www.srh.noaa.gov/tulsa/wcm/spotter.html

We're still getting better and better training tools to help you learn the essentials of storm spotting. Also, we plan to cover some of the bigger events from last year, including the 40+ mile-long path of the F3 tornado from May 8 in Osage County. We hope to see you there! *

George Mathews -
Warning Coordination Meteorologist

Hydrological Forecasts

There is a new addition to the WFO Tulsa webpage - the WFO AHPS webpage. AHPS is an acronym for the Advanced Hydrologic Prediction Service. AHPS seeks to provide hydrologic information and products through the infusion of new science and technology. The WFO Tulsa AHPS webpage will contain a suite of web-based hydrologic forecast products based on the state-of-the-science.

The WFO AHPS webpage will evolve as new products become available. Eventually, they will reflect the degree of uncertainty of the magnitude of forecasted floods. These graphical probabilistic forecast products will provide planning tools for many economic and emergency managers. This will enable government agencies, private institutions, and individuals to make more informed decisions to mitigate the dangers posed by floods through risk-based policies and actions. *

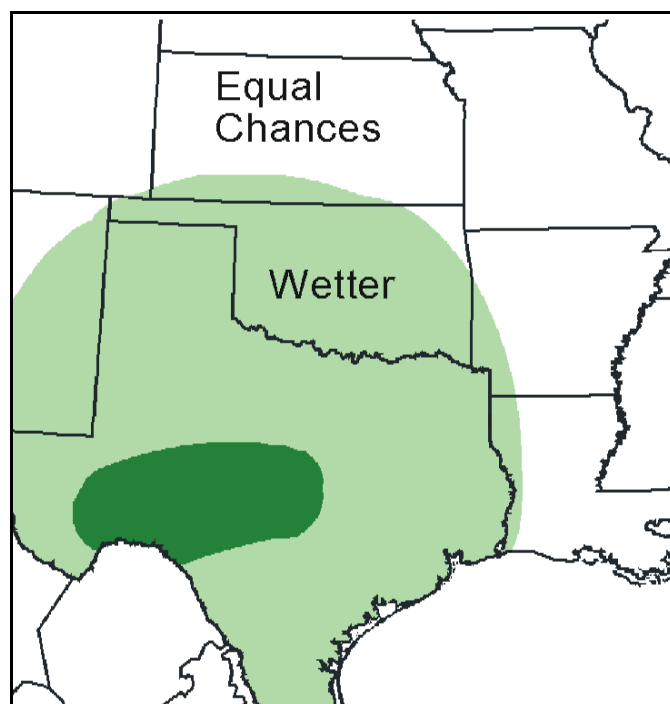
Al Hong - Service Hydrologist

Additional information may be obtained on line at:
www.nws.noaa.gov/oh/ahps

Winter Outlook for 2003-04

While ocean temperatures in the tropical Pacific are warmer than long-term averages, and may even reach the level of a weak El Niño by late November, El Niño is not expected to exert a major influence on U.S. climate this winter, unlike most winters in recent years. Without a strong El Niño or La Niña signal as a guide, there is more uncertainty in the long term forecast, but winter should bring its typical weather variability. In cases where a dominant climate feature in the Pacific Ocean is missing, forecasters rely on historical trends of temperature and precipitation averages as well as dynamical and statistical models.

Based on these tools, NOAA forecasters expect temperatures will likely be warmer than the long-term averages over the southern plains. Above normal precipitation is expected across Texas, most of Oklahoma and eastern New Mexico. *



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Extraordinary

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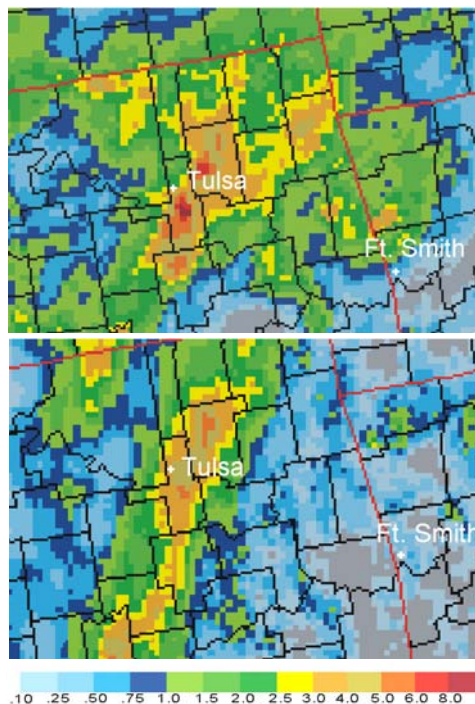
bance was making its way across the central and southern plains. The low levels of the atmosphere were very moist, with dew points over 70 degrees across central and eastern Oklahoma, which is not unusual for late summer. This seemingly ordinary pattern became the catalyst for record rainfall over the next several days. What transformed ordinary into extraordinary was the persistence of the pattern.

As expected, thunderstorms developed across the region late Friday. A strong southerly low level jet caused storms to intensify and produce heavy rain. At the same time, extremely weak upper level winds caused the storms to be slow moving. The result was a narrow swath of 6 to 8 inch rainfall totals across northeast Oklahoma Friday night.

As the low level jet weakened Saturday morning, the rain slowly decreased in aerial coverage and intensity. However, the upper level disturbance and the stationary front remained in place. By Saturday afternoon, an area of surface low pressure formed along the front in north central Oklahoma, enhancing the northward flow of moisture from the Gulf of Mexico. Otherwise, the scenario was essentially the same as the day before.

By late afternoon, storms began to fire across the area once again. During the night, the low level jet reintensified, enhancing the rainfall. Once again, storms were slow moving, and very heavy rains fell across much of eastern Oklahoma.

The low level jet weakened again Sunday morning, and the rain slowly ended. Rainfall totals, although less than the prior night, were still extraordinary. Luckily, the swath of maximum rainfall, as indicated by National Weather Service Doppler radar, was offset slightly from the night before. Going into Sunday night, weather conditions north of the Red River were relatively unchanged from the prior two nights. A weak distur-



Gage biased radar estimated rainfall from August 30 (top) and 31 (bottom).

bance persisted in the upper levels across the central and southern plains. The stationary front and numerous outflow boundaries were strung across Kansas, Oklahoma and northwest Arkansas.

However, a new ingredient was added to the mix. The remnants of Tropical Storm Grace, moving inland and positioned over central Texas, began to enhance moisture influx from the Gulf of Mexico.

Once again, a large area of precipitation developed across the region overnight, but was accompanied by very little lightning, which is more characteristic of tropical rainfall.

Sunday night's rain was also widespread and produced a narrower swath of excessive rainfall. The heaviest rainfall was offset slightly to the north and east of the two previous nights. This time, precipitation did not significantly decrease during the daylight hours, further signifying a change in weather conditions.

On Monday afternoon, September 1st, for the fourth day in a row, the stationary front remained positioned across Oklahoma. In addition, the remnants of Tropical Storm Grace were spinning along and east of the front through southeast Oklahoma. This produced yet another day of enhanced rainfall across the Tulsa forecast area.

By Tuesday, as the remnants of Tropical Storm Grace moved northeastward away from the region, rainfall ended and tranquil weather finally returned to the southern plains. After five consecutive days of drenching rains, portions of the Tulsa forecast area accumulated some impressive storm totals. Tulsa International Airport accumulated nearly eight inches of rain over the five day period, but totals were significantly higher in other more remote areas. Fortunately, each successive day's swath of maximum rainfall was offset from prior days, helping to avoid a major disaster. *

Bruce Sherbon - Meteorologist



Wind Event

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a line of thunderstorms, and the severe weather threat to last well into the night. Strong winds and large hail were expected to be the primary threats from any storms that became severe.

Around 4 pm, a thunderstorm began to develop over Osage County and by 5:30 pm, forecasters at the NWS Tulsa office were issuing severe thunderstorm warnings. Additional cells began developing across north-east Oklahoma and tracked to the southeast at 30 miles per hour. By 6 pm, these thunderstorms merged into a complex of storms, referred to as a bow echo, which continued to march southeast across eastern Oklahoma. The leading edge of these severe storms produced wind gusts up to 80 mph.

By 8 pm, this complex of strong to severe thunderstorms stretched along a line from West Siloam Springs, AR to Webbers Falls to Eufaula to Okemah. It was during this time that a festival was being held at Eufaula Cove on Eufaula Lake. A man standing in a parking lot at the festival was struck and killed by lightning as the line of thunderstorms passed through the area. Although lightning produced the lone fatality from the storms, damage from winds in excess of 60 mph continued to be reported along the leading edge. The thunderstorm complex then swept into western

Arkansas, and by 10 pm, had exited the Tulsa county warning area.

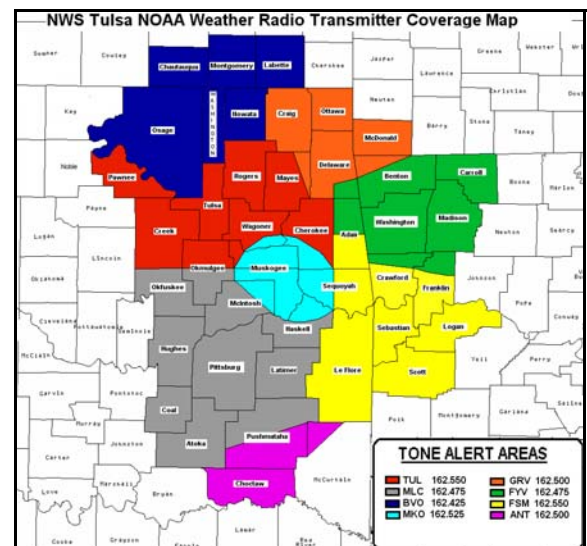
During the afternoon and evening hours of August 1, 24 severe thunderstorm warnings were issued by the NWS office in Tulsa. Although there were a few reports of 0.75 and 1 inch hail in Tulsa County, the main impact of the storms was a swath of wind damage from Osage County, OK to Sebastian County, AR. Numerous trees were blown down across the region, blocking roadways and damaging the cars and homes they fell on. Debris blocked as many as one hundred streets in Ft. Smith alone. Just south of Coweta, OK, a large tree fell on a mobile home, almost destroying it. A man inside the mobile home suffered cuts as debris flew off the headboard of his bed when the tree hit. Power lines throughout the area were also knocked down by the strong winds, leaving much of Coweta, Tahlequah, and Fort Smith without power. 38,000 residents in southern Tulsa County were also without power due to the severe winds. There were also a number of reports of shingles blown off roofs and metal siding blown off houses and buildings. A wind gust estimated at 80 mph caused a tractor-trailer to overturn near Webbers Falls as it was crossing the Arkansas River Bridge on Interstate 40. A second tractor-trailer then ran into the first. *

Nicole Kempf, Mark Abbas - Meteorologists

New NOAA Weather Radio Transmitters

Two new NOAA Weather Radio transmitters are now on line to help provide more complete coverage for eastern Oklahoma. The Bartlesville, OK transmitter now broadcasts at a frequency of 162.425 MHz, while the Okemah, OK transmitter broadcasts at a frequency of 162.525 MHz.

NOAA Weather Radio provides continuous broadcasts of the latest weather information from the National Weather Service in Tulsa, and other offices nationwide, 24 hours a day, 365 days a year. Weather messages are repeated every 3 to 5 minutes and are routinely updated every 1 to 3 hours or more frequently during rapidly changing local weather or if a nearby hazardous environmental condition exists. *



How Accurate?

Everyone remembers the bad forecast, or what you were doing when the unexpected happened. We at the National Weather Service remember those well too, and in fact we measure our forecasts every day. The Tulsa NWS staff just finished their review of Fiscal Year 2003 which ended in September. The numbers show that Tulsa forecasters have continued to nearly always improve upon the guidance prepared at the National Center for Environmental Prediction in Washington, D.C.

For the first four forecast periods (today, tonight, tomorrow, etc), Tulsa forecasters had an average error in the first period of 2.65 degrees F at Tulsa, Fort Smith, McAlester and Fayetteville. These sites have been chosen because of they have routine observations available and are roughly in the four corners of the NWS Tulsa forecast area. In the 2nd, 3rd, and 4th forecast periods the errors naturally grow slightly with each period. In FY 2003, NWS Tulsa staff performed best at Fort Smith, but the differences between the four stations was on the order of just a few tenths of a degree. By the fourth period the error at Fort Smith was 3.33 degrees F, and was about 3.65 degrees F at the other three.

While the Tulsa office has used 4 stations to evaluate its forecasts, we have begun collecting verification information for Miami, Bartlesville, Muskogee, Hugo, Berryville, Jenks, and Henryetta. We are also now beginning to collect data out to 7 days. All of this is done to strive for constant improvement in what we do. *

Steven Piltz - Meteorologist in Charge

Christmas Climatology

As we all know, the weather in eastern Oklahoma and western Arkansas can be quite variable to say the least. This is especially true during the cooler times of year, when the jet stream is usually nearby and low pressure systems and cold fronts frequent the area. This variability certainly holds true when looking at Christmas climatology. In fact, it is hard to say what “normal” Christmas weather is around here. Looking at the data over the years, it seems we may be just as likely to spend Christmas wearing shorts as we are to be shoveling snow.

When thinking of Christmas weather, most people ask, “What are the chances of a white Christmas”? The answer to that for this area is not very good. Only a handful of times since records began has there been an inch or more of snow on the ground in Tulsa. Only a few times has snow fallen on Christmas Day, with a record 1.3 inches occurring in 1975.



Scenes like this were common in eastern Oklahoma during the Christmas ice storm in 2000.

Interestingly, two of the last three years have seen significant winter storms in the area at Christmastime. Last year, much of northeast Oklahoma and northwest Arkansas experienced a white Christmas as a winter storm on the 23rd and 24th dumped 6 to 12 inches roughly north of a Tulsa to Fayetteville line (see Spring 2003 edition). In 2000, a slow moving winter storm brought heavy freezing rain and dangerous ice accumulations, leaving some 200,000 residents of southeast Oklahoma without power and causing well over \$100 million dollars in damage.

As for temperatures, daytime highs average in the mid to upper 40s, while nighttime lows “typically” fall into the mid to upper 20s. Of course, due to our location, extreme temperatures can occur. The coldest Christmas ever in Tulsa was 1983, when a bitter cold arctic airmass covered much of the United States. The morning low in Tulsa was -2 degrees F, while the daytime high reached only 12 degrees F. Conversely, the warmest Christmas ever was 1922, when the high reached a balmy 72 degrees F.

So, what will Christmas be like this year? It’s really impossible to say at this point, but the law of averages would imply a very slim chance of a white Christmas – slim but not impossible. *